

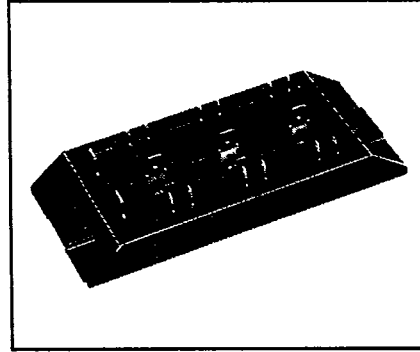
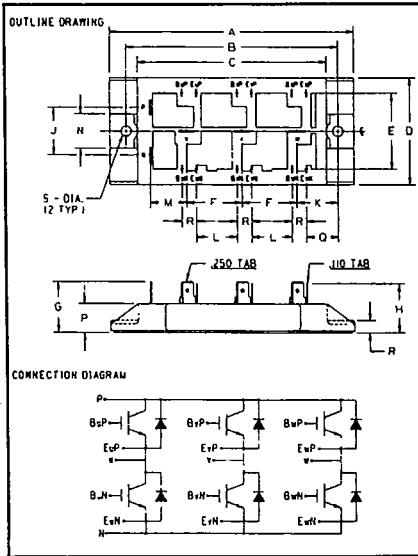


Powerex, Inc., Hillis Street, Youngwood, Pennsylvania 15697 (412) 925-7272  
 Powerex, Europe, S.A. 428 Avenue G. Durand, BP107, 72003 Le Mans, France (43) 41.14.14

IEF21KA2 - T-39-31

## Six-IGBT IGBTMOD™ Power Module

25 Amperes/1000 Volts



**IEF21KA2**  
**Six-IGBT IGBTMOD™ Power Module**  
 25 Amperes/1000 Volts

### IEF21KA2 Outline Drawing

Dimension	Inches	Millimeters
A	5.00	127
B	4.33±.01	110±0.3
C	3.86	98
D	2.20	56
E	1.57	40
F	1.12	28.5
G	1.04	26.5
H	1.01	25.6
J	.98	25
K	.85	21.5
L	.83	21
M	.75	19
N	.71	18
P	.69	17.5
Q	.65	16.5
R	.30	7.5
S	.22 Dia.	Dia. 5.5

### Description

Powerex IGBTMOD™ Modules are designed for use in switching applications. Each module consists of six IGBT Transistors in a three phase bridge configuration, with each transistor having a reverse-connected super-fast recovery free wheel diode. All components and interconnects are isolated from the heat sinking baseplate, offering simplified system assembly and thermal management.

### Features:

- Low Drive Power
- Low  $V_{CE(sat)}$
- Discrete Super-Fast Recovery (150ns) Free Wheel Diode
- High Frequency Operation (15-20kHz)
- Isolated Base Plate for Easy Heat Sinking

### Applications:

- AC Motor Control
- Motion/Servo Control
- UPS
- Welding Power Supplies
- Laser Power Supplies

### Ordering Information

Example: Select the complete eight digit part module number you desire from the table below -i.e. IEF21KA2 is a 1000V ( $V_{CES}$ ), 25 Ampere Six-IGBT IGBTMOD™ Power Module.

Type	$V_{CES}$ Volts (1000)	Current Rating Amperes (25)
IEF2	1K	A2



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### IEF21KA2

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### Absolute Maximum Ratings, $T_j = 25^\circ\text{C}$ unless otherwise specified

Ratings	Symbol	IEF21KA2	Units
Junction Temperature	$T_j$	-40 to 150	$^\circ\text{C}$
Storage Temperature	$T_{\text{stg}}$	-40 to 125	$^\circ\text{C}$
Collector-Emitter Voltage (G-E SHORT)	$V_{\text{CES}}$	1000	Volts
Gate-Emitter Voltage	$V_{\text{GES}}$	$\pm 20$	Volts
Collector Current	$I_C$	25	Amperes
Peak Collector Current	$I_{\text{CM}}$	50*	Amperes
Diode Forward Current	$I_{\text{FM}}$	25	Amperes
Diode Forward Surge Current	$I_{\text{FM}}$	50*	Amperes
Power Dissipation	$P_d$	250	Watts
Max. Mounting Torque M Terminal Screws	—	—	in.-lb.
Max. Mounting Torque M5 Mounting Screws	—	17	in.-lb.
Module Weight (Typical)	—	390	Grams
V isolation	$V_{\text{RMS}}$	2500	Volts

\* Pulse width and repetition rate should be such that device junction temperature does not exceed the device rating.

### Static Electrical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector-Cutoff Current	$I_{\text{CES}}$	$V_{\text{CE}} = V_{\text{CES}}, V_{\text{GE}} = 0\text{V}$	—	—	1.0	mA
Gate Leakage Current	$I_{\text{GES}}$	$V_{\text{GE}} = V_{\text{GES}}, V_{\text{CE}} = 0\text{V}$	—	—	0.5	$\mu\text{A}$
Gate-Emitter Threshold Voltage	$V_{\text{GE(th)}}$	$I_C = 2.5\text{mA}, V_{\text{CE}} = 10\text{V}$	3.0	4.0	6.0	Volts
Collector-Emitter Saturation Voltage	$V_{\text{CE(sat)}}$	$I_C = 25\text{A}, V_{\text{GE}} = 15\text{V}$	—	3.5	5.0**	Volts
		$I_C = 25\text{A}, V_{\text{GE}} = 15\text{V}, T_j = 150^\circ\text{C}$	—	3.5	**	Volts
Total Gate Charge	$Q_G$	$V_{\text{CC}} = 600\text{V}, I_C = 25\text{A}, V_{\text{GS}} = 15\text{V}$	—	165	—	nC
Diode Forward Voltage	$V_{\text{FM}}$	$I_C = -25\text{A}, V_{\text{GS}} = 0\text{V}$	—	—	2.5	Volts

\*\* Pulse width and repetition rate should be such that device junction temperature rise is negligible.

### Dynamic Electrical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Input Capacitance	$C_{\text{igs}}$	—	—	—	5000	pF
Output Capacitance	$C_{\text{ges}}$	$V_{\text{GE}} = 0\text{V}, V_{\text{CE}} = 10\text{V}, f = 1\text{MHz}$	—	—	1200	pF
Reverse Transfer Capacitance	$C_{\text{res}}$	—	—	—	120	pF
Resistive Load	Turn-on Delay Time	$V_{\text{CC}} = 600\text{V}, I_C = 25\text{A}, V_{\text{GE1}} = V_{\text{GE2}} = 15\text{V}, R_G = 50\Omega$	—	—	250	ns
	Rise Time					
Switch Times	Turn-off Delay Time	$V_{\text{CC}} = 600\text{V}, I_C = 25\text{A}, V_{\text{GE1}} = V_{\text{GE2}} = 15\text{V}, R_G = 50\Omega$	—	—	600	ns
	Fall Time					
Diode Reverse Recovery Time	$t_{\text{rr}}$	$I_E = 25\text{A}, di_E/dt = -50\text{A}/\mu\text{s}$	—	—	300	ns
Diode Reverse Recovery Charge	$Q_{\text{rr}}$	$I_E = 25\text{A}, di_E/dt = -50\text{A}/\mu\text{s}$	—	0.4	—	$\mu\text{C}$

### Thermal and Mechanical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

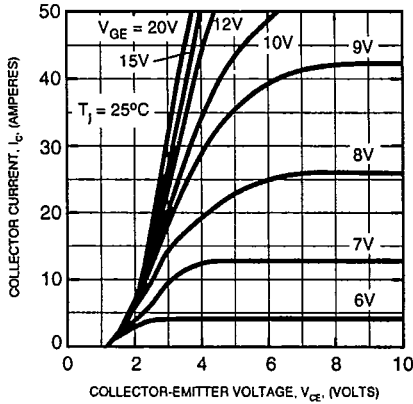
Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case	$R_{\text{th(j-c)}}$	Per IGBT	—	—	0.50	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Case	$R_{\text{th(j-c)}}$	Per Free Wheel Diode	—	—	1.40	$^\circ\text{C}/\text{W}$
Contact Thermal Resistance	$R_{\text{th(c-l)}}$	Per 1/6 Module	—	—	0.25	$^\circ\text{C}/\text{W}$



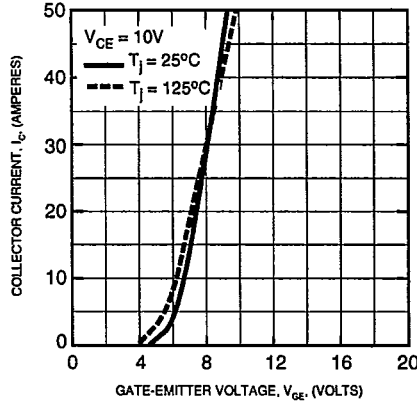
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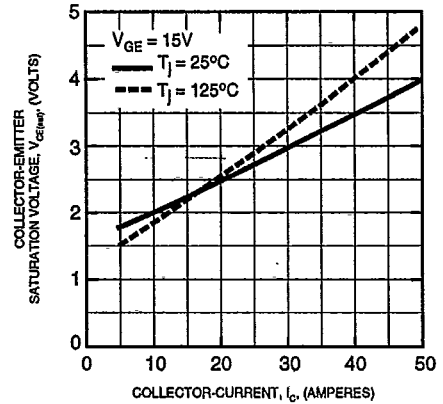
OUTPUT CHARACTERISTICS (TYPICAL)



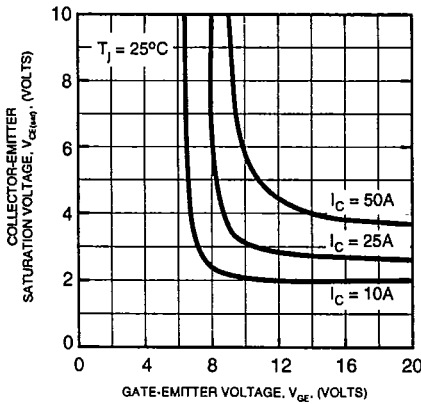
TRANSFER CHARACTERISTICS (TYPICAL)



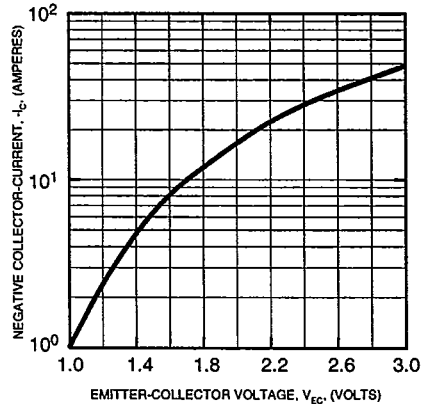
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



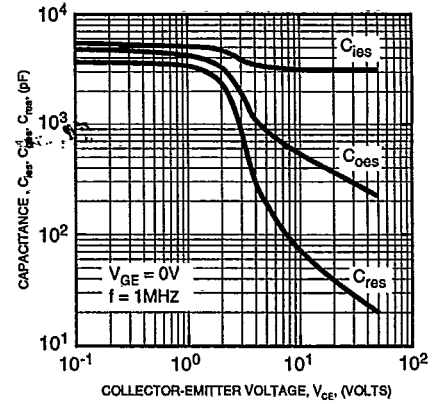
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



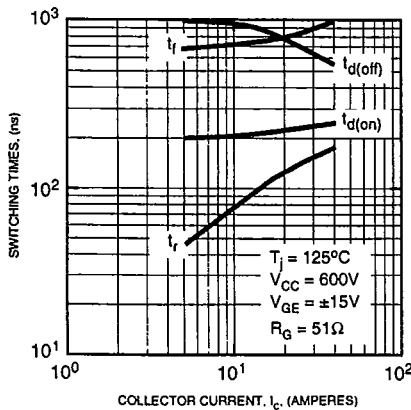
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



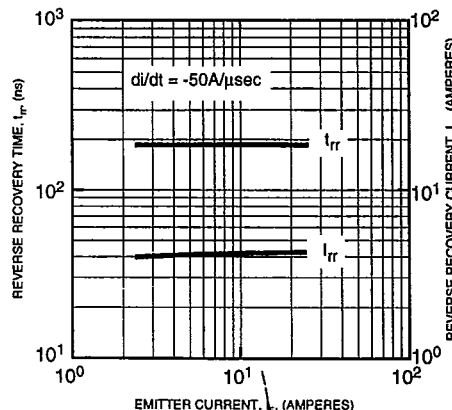
CAPACITANCE VS. Vce (TYPICAL)



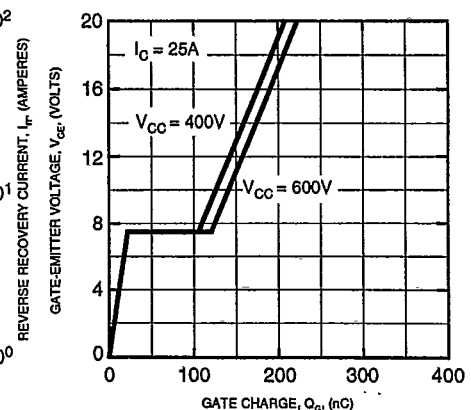
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



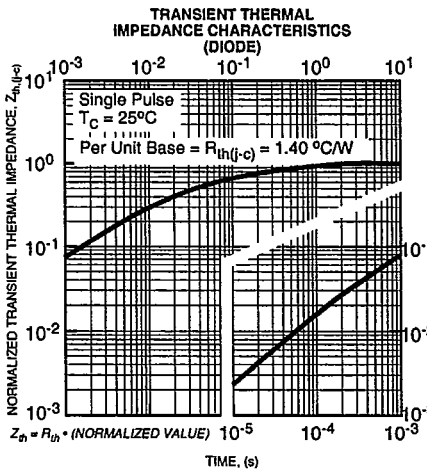
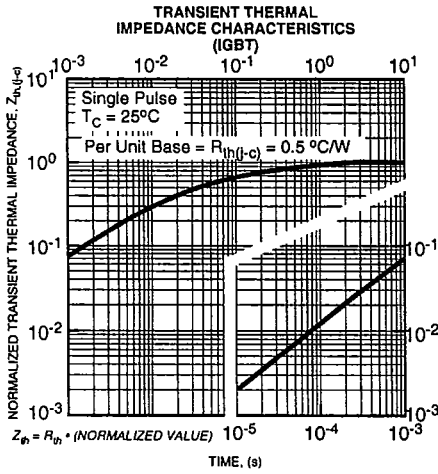
GATE CHARGE, Vge



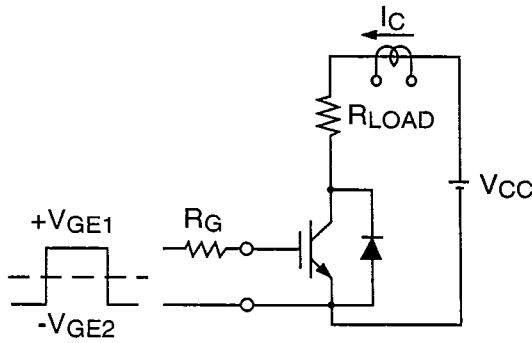


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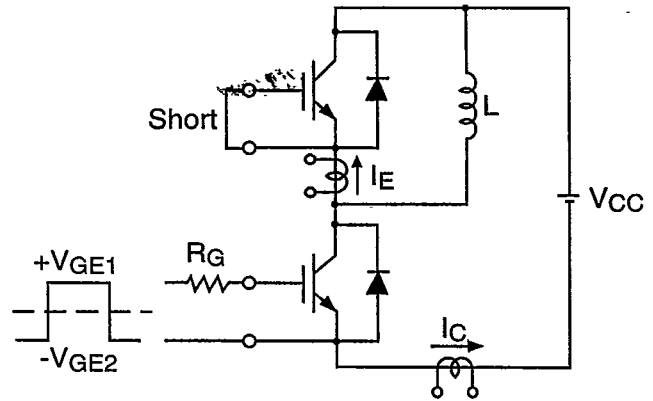
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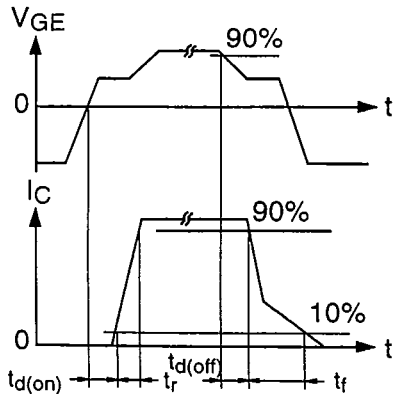
SWITCHING TIME TEST CIRCUITS & WAVEFORMS



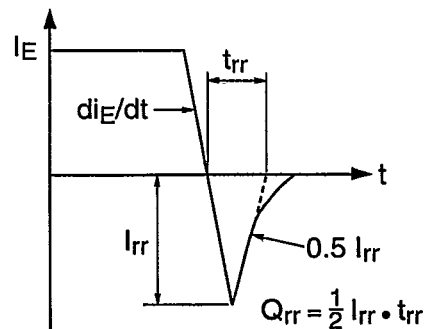
Resistance Load Switching Test Circuit



Half-Bridge Switching Test Circuit



Switching Time Test Waveforms



trr, Qrr Waveforms